

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	随机分析及其在金融中的应用 Stochastic calculus and their applications in finance
2.	授课院系 Originating Department	数学系 Department of Mathematics
3.	课程编号 Course Code	MAT7030
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	英文 English
8.	授课教师、所属学系、联系方式 (如属团队授课, 请列明其他授课教师) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	熊捷, 讲座教授, 数学系 慧园 3 栋 527 Jie Xiong, Chair Professor, Department of Mathematics Block 3 Room.527, Wisdom Valley
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours	48				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA301 实变函数, MA215 概率论; MA301 Theory of functions of a real variable, MA215 Probability Theory				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite					
14. 其它要求修读本课程的学系 Cross-listing Dept.					

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

With the fast development of mathematical finance in recent years, stochastic calculus has been widely used in finance. This course is designed as the first courses in financial calculus for students having a good background in mathematics. After learning this course, students should understand the key concepts in stochastic analysis such as martingales and change of measure and some deep properties of Brownian motion process. The students should also be able to apply the basic methods and tools learning from this course such as the Ito's formula and the Black-Scholes pricing formula in practical problems in finance.

随着金融数学的迅速发展, 随机分析在金融中有了越来越多的应用。本课程是针对具有良好数学背景的学生设计的金融数学里面的第一门课程。通过本课程的学习, 学生应该了解在随机分析中的一些关键概念, 例如鞅和测度变换和布朗运动过程中的一些深层次的性质。学生还应能运用本课程学习中的基本方法和工具, 如伊藤公式和布莱克-斯科尔斯定价公式, 来解决金融实际问题。

16. 预达学习成果 **Learning Outcomes**

After completing this course, students should master the basic concepts and methods in stochastic analysis. After learning this course, the students should be familiar with a range of methods and techniques for solving real life problems in finance. In particular, after learning this course, the students should be able

1. to master the basic knowledge, deeply to understand and master the nature of the definitions, theorems, principles and formulae. After the study, the students should be able not only to remember the above concepts and the basic laws, but also deeply to understand some difficult theoretic conclusion with fully applications and examples. Students can know how to use these theoretic conclusions first and then know how to make the strict proofs
2. to understand the exact probabilistic meaning of these concepts and could fully master the related conclusions and then could apply them in many different problems.
3. to train the ability of thinking and to enhance the ability to Pay attention to the newly and recently obtained conclusions ;
4. To improve the ability of solving practical problems. After learning this course, students should also be able to apply the basic methods and tools learning from this course such as the Ito's formula and the Black-Scholes pricing

formula in practical problems in finance.

完成本课程后,学生应掌握随机分析的基本概念和方法,熟悉各种在金融中的相关应用,并能解决现实生活提出的问题。特别是,在学习本课程后,学生应该能够

- 1.掌握基本知识,深刻理解和掌握定义、定理、原理和公式的性质。经过研究,学生不仅要记住上述概念和基本规律,而且通过课堂的充分应用和举例说明,学生要充分理解一些疑难理论结论。学生首先知道如何使用这些理论结论,然后知道如何做严格的证明。
- 2.能理解这些概念的确切概率意义,能充分掌握相关结论,并将其应用到许多不同的问题中。
- 3.培养思维能力,提高对最新的、最前沿的知识结论学习的能力。
- 4.提高解决实际问题的能力。学习本课程后,学生应能运用本课程学习中的基本方法和工具,如伊藤公式和布莱克-斯科尔斯定价公式,来解决金融实际问题。

17. 课程内容及教学日历 (如授课语言以英文为主,则课程内容介绍可以用英文;如团队教学或模块教学,教学日历须注明主讲人)

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section1

Brownian motion (16 hours)

Definition of the process; Levy's construction of Brownian motion; The reflection principle and scaling;

Martingales in continuous time

Section 2

Stochastic calculus(16 hours)

Stochastic integration; Ito's formula; Integration by parts; Stochastic Fubini Theorem ; The Girsanov Theorem; The Brownian Martingale Representation Theorem; The Feynman-Kac representation

Section 3

The Black-Scholes model(16 hours)

The basic Black-Scholes model; Black-Scholes price and hedge for European options ;Foreign exchange ;Dividends; Bonds ;Market price of risk.

18. 教材及其它参考资料 **Textbook and Supplementary Readings**

Textbook:

Alison Etheridge, A course in financial calculus. Cambridge University Press 2002

Supplementary Readings:

1. Ioannis Karatzas, Steven Shreve, Brownian Motion and Stochastic Calculus

2 Rene Schilling, Brownian Motion: An Introduction to Stochastic Processes.

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20%		
期中考试 Mid-Term Test		30%		
期末考试 Final Exam		50%		
期末报告 Final Presentation				
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

A. 十三级等级制 **Letter Grading**
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

数学系课程规划与审核委员会
 Curriculum Planning and Review Committee, Department of Mathematics